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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/809,253	03/25/2004	Jing-Jong Pan	LWAVP018D1	6910

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EXAMINER	
CALEY, MICHAEL H	

ART UNIT	PAPER NUMBER
2871	

DATE MAILED: 10/19/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/809,253	ITAKURA ET AL.	
	Examiner	Art Unit	
	Michael H. Caley	2871	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *19-43* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *19-27,32-35 and 40-43* is/are rejected.

7)☒ Claim(s) *28-31 and 36-39* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 July 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *03252004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 19, 21, 23, 24-27, 32, 33, 40, and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Young et al. (U.S. Patent No. 6,330,380 "Young") in view of Shankar et al. (U.S. Patent No. 4,991,924 "Shankar").

Regarding claim 1, Young discloses an optical switch system having:

an array of input optical fibers (Figure 10 elements 105-1, 105-M);

an array of first output optical fibers (Figure 10 elements 15-1, 15-N); and

a switching matrix (Figure 10 elements 11 and 120) of liquid crystal cell units (Column 5 lines 46-63), each liquid crystal cell unit reflecting or transmitting light selectively responsive to control signals (Figure 10 element 125) and arranged with respect to the array of input optical fibers and the array of first output optical fibers so that light signals from an input optical fiber may be selectively reflected or transmitted by the liquid crystal cell unit into one of the first output optical fibers.

Young fails to disclose the liquid crystal cell units as cholesteric. Shankar, however, teaches the advantageous use of cholesteric liquid crystal in an optical switching device

benefiting from low insertion loss (Column 2 lines 15-30). Cholesteric liquid crystal cells are well known in the art to have the ability to selectively transmit or reflect light in response to an external stimulus in an analogous manner to the liquid crystal cell disclosed by Young.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have implemented the switching system disclosed by Young using a cholesteric liquid crystal cell as taught by Shankar. One would have been motivated to use a liquid crystal cell in the switching system disclosed by Young due to the reduced complexity of manufacturing and operation in comparison to a mechanically moved mirror (Column 1 lines 7-39). Furthermore, one would have been motivated to implement such a cell as a cholesteric liquid crystal cell due to the low insertion loss properties and lesser expensive optical components compared to that of a nematic liquid crystal layer (Column 1 lines 7-39).

Regarding claim 21, Young discloses a second set of output optical fibers as proposed. For instance, a first set may be considered to be elements 15-1 and 15-2 while the second set is elements 15-3 to 15-N since the claim does not imply a structural difference beyond a categorization by the nomenclature of the sets.

Regarding claim 23, Young fails to disclose the cell structure as proposed. Shankar, however, teaches a liquid crystal cell unit comprising:

> a first cholesteric liquid crystal cell receiving incident light, said first cholesteric liquid crystal cell reflecting circularly polarized light of one state of said incident light or

transmitting said incident light responsive to a control signal (Figures 3A and 3B elements 104, 102, and 110; Column 6 lines 7-35);

a second cholesteric liquid crystal cell arranged with respect to said first cholesteric liquid crystal cell to receive light transmitted by said first cholesteric liquid crystal cell, said second cholesteric liquid crystal cell selected to reflect or transmit light from said first cholesteric liquid crystal cell responsive to said control signal when said cholesteric liquid crystal cell reflects said circularly polarized light of said one state or transmits said incident light respectively (Figures 3A and 3B elements 104, 102, and 110; Column 6 lines 7-35; Figures 2A and 2B; Column 5 lines 32-65)).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have implemented the switching system disclosed by Young using a cholesteric liquid crystal cell as taught by Shankar. One would have been motivated to use a liquid crystal cell in the switching system disclosed by Young due to the reduced complexity of manufacturing and operation in comparison to a mechanically moved mirror (Column 1 lines 7-39). Furthermore, one would have been motivated to implement such a cell as a cholesteric liquid crystal cell due to the low insertion loss properties and lesser expensive optical components compared to that of a nematic liquid crystal layer (Column 1 lines 7-39).

Regarding claims 24-27, Young fails to disclose the proposed features of the cholesteric liquid crystal cell.

Shankar, however, teaches a pi-phase waveplate element between the first and second cholesteric liquid crystal cells comprising a third liquid crystal cell or plate of birefringent material (Figures 3A and 3B element 106; Column 4 lines 55-63). Additionally, Shankar teaches the first cholesteric liquid crystal cell as comprising a first cholesteric liquid crystal reflecting circularly polarized light in one state and the second cholesteric liquid crystal cell comprising a second cholesteric liquid crystal reflecting circularly polarized light in an opposite state (Figures 3A and 3B).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have implemented the switching system disclosed by Young using a cholesteric liquid crystal cell as taught by Shankar. One would have been motivated to use a liquid crystal cell in the switching system disclosed by Young due to the reduced complexity of manufacturing and operation in comparison to a mechanically moved mirror (Column 1 lines 7-39). Furthermore, one would have been motivated to implement such a cell as a cholesteric liquid crystal cell due to the low insertion loss properties and lesser expensive optical components compared to that of a nematic liquid crystal layer (Column 1 lines 7-39).

Regarding claims 32, 33, 40, and 41, Young fails to disclose the proposed features of the input and output optical fibers. Shankar, however, teaches collimating GRIN lenses for the input and output optical fibers (Figure 7A elements 372 and 374).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have formed an array of collimating lenses for the array of optical fibers. One

would have been motivated to provide such an array as a means of properly focusing the input and output beam and light in relation to the switching matrix.

Claims 20 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Young in view of Shankar and in further view of Cao (U.S. Patent No. 6,798,938).

Regarding claims 20 and 22, Young as modified by Shankar fails to discloses the array of input optical fibers and the array of first output optical fibers as comprising two-dimensional arrays, and the switching matrix of cholesteric liquid crystal cell units as having a three dimensional array. Cao, however, teaches the input array and output arrays as two dimensional arrays and the switching network as a three dimensional array (Figure 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have implemented the input array and output array as two dimensional arrays and the switching matrix as a three dimensional array. One would have been motivated to construct the switching matrix as proposed in order to accommodate for a switching network involving a larger number of inputs and outputs using techniques conventional in the art.

Claims 34, 35, 42, and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Young in view of Shankar and in further view of Shahid (U.S. Patent No. 6,256,448).

Young as modified by Shankar fails to disclose first and second plates having V-grooves which are stacked to form a two-dimensional array of optical fibers. Shahid, however, teaches such an arrangement of stackable optical fibers as a means of forming a two dimensional array of fibers, such as for a connector (Figure 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used plated containing V-grooves as proposed as a means of forming the two-dimensional array of optical fibers. V-grooves are a well-known method in the art of securing an input or output end of an optical fiber in a specific location as taught by Shahid. One would have been motivated to use such a V-groove arrangement as a means of securing the array of optical fibers in order to ensure precise placement and efficient coupling with the switching matrix.

Allowable Subject Matter

Claims 28-31 and 36-39 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The prior art of record fails to disclose or suggest a plurality of cholesteric liquid crystal cell mounting plates, each having a one-dimensional array of units and being arranged at an angle with respect to the array of input optical fibers and output optical fibers.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael H. Caley whose telephone number is (571) 272-2286. The examiner can normally be reached on M-F 8:30 a.m. - 5:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim can be reached on (571) 272-2293. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Michael H. Caley
October 11, 2004

TARIFUR R. CHOWDHURY
PRIMARY EXAMINER